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Development of Kaizen Sustainability Model for Medium Manufacturing Enterprises of Ethiopia

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Abstract:

The purpose of this study is to develop kaizen sustainability model in medium manufacturing enterprises in the case of Gurage zone Administration of Ethiopia. To achieve the purpose of the study, data is collected from both primary and secondary sources. The primary data were collected from Technical & Vocational Education & Training (TVET) trainers, TVET leaders, Medium Manufacturing Enterprise (MME's) operators, and MME's experts using questionnaires, semi-structured interviews, and observations. Secondary data were obtained from available documents from Ethiopian Kaizen Institute (EKI), published papers in international journals and conferences. The quantitative data were analyzed using SPSS Version 21. The study revealed that the main factors distressing sustainability of kaizen are gaps in knowledge & skill, short-termism, inadequate use of kaizen implementation tools, centralized decision making, individualism, absence of functional diversity in kaizen event team, poor use of visual management tools(VMT), absence of rewarding & recognition scheme. To tackle these problems a kaizen sustainability model comprising eight interrelated steps has been developed.

Keywords: Kaizen, MME's, kaizen sustainability, TVET, key performance indicators

1, Introduction

The Kaizen management originates in the best Japanese management practices and is dedicated to the improvement of productivity, efficiency & quality. Kaizen is a combination of two words ('Kai' and 'Zen') from one Japanese concept that its definition refers to a change toward better or continuous and gradual improvement. In fact, Kaizen stands on the philosophy that is not necessary to look for explosive or sudden changes for improvement of the organizations, but any improvement or reform will bring productivity enhancement if they are continuous and constant (Thesseloniki, 2006)[1]. The concept of Kaizen is so deep-rooted in the minds of Japanese people that they often do not even realize that they are thinking Kaizen. Japanese people use the inborn instinct of being continuous change present in every human being and work for betterment by using existing resources available within the firm instead of spending a lot much money on technologies (Barnes, 1996)[2]. The kaizen implementation crucially includes the complete involvement of employees from worker to top-level management in the organization. Kaizen involves small but continuous improvement & this small change can improve the productivity by huge multiplication. In short, Kaizen distinguishes as the best method of performance improvement among all the techniques as it involves low implementation cost. Nowadays, organizations carry on seeking innovative ideas for improving their processes and retaining a competitive edge. Kaizen is a concept that focuses on improving a work area or an organization in incremental steps by eliminating waste.

According to National Graduate Institute for Policy Studies Development Forum publication in 2006, implementation of kaizen in Ethiopian manufacturing industries was driven by the strong commitment of the top leader. During the two-year period of Japan International Cooperation Agency (JICA) support (on the study Quality and Productivity Improvement in Ethiopia, from October 2009 to May 2011), pilot company projects were implemented, and their results have been disseminated and a national plan has been formulated to disseminate kaizen activities for manufacturing companies.

As a result, kaizen has come to be known among policy makers and business managers in Ethiopia. Based on these achievements, the Ethiopian government has decided to establish a core organization responsible for quality and productivity improvement, Ethiopian Kaizen Institute (EKI). JICA has begun new support for the institutionalization of EKI in such areas as organizational development, human resource development, and nationwide dissemination of Kaizen

However, the major obstacle for many organizations is to actually sustain or improve the results of a Kaizen event after its conclusion. According to the report of Laraia (1999)[3], many organizations find great difficulty in sustaining kaizen over time, even 50% of the improvements initially realized at the conclusion of the event.

2. Literature Review

To address the sustainability of continuous improvement, Kaye and Anderson (1999)[4] reviewed relevant literature and conducted semi-structured interviews. Their research resulted in a model that highlights the ten essential criteria of continuous improvement.

Utari (2001)[5] claimed that sustainability, continuous improvement over time, depends upon the underlying view of how improvement is achieved implicit in the actions of both managers and operators. Upton's continuous improvement initiatives model focuses on accelerating performance improvement, maintaining consistent long-term objectives, and choosing periodic projects based on organizational ability. These focus areas appear to provide direct improvement in the chosen direction and provide a platform for future gains.

Readman and Bessant (2007)[6] assessed the results of the United Kingdom's (UK) Continuous Improvement Survey that was administered to 1000 UK firms. A part of the survey inquired about enabling improvement activities that served to encourage or reinforce the continuous improvement behaviors and routines.

Anand (2009)[7] identified infrastructure decision areas that are important for continuous improvement initiatives through the creation of a framework of continuous improvement, as a dynamic capability, when it includes a comprehensive organizational context.

To address the sustainability of various process improvement activities, Dale et al., (1997)[8] identified key TQM sustainability issues through qualitative research and reference to relevant theoretical literature.

Keating (1999)[9] worked with research partners to address general process improvement program sustainability. System dynamics modeling analysis explained both internal dynamics and external interactions that appear to influence the sustainability of process improvement activities. Many of these studies emphasize the following characteristics or activities in order to sustain improvement outcomes over time: communication within the work area and across various levels of the organization (top-down, bottom-up, and lateral communication), work area employee focus and commitment, improvement activity characteristics (e.g., project scope, goals, and improvement team dynamics), improvement culture, learning (education and training), management, measurement, and organizational structure and policies. Less commonly-noted sustainability characteristics are the impact of the external environment, external stakeholders, and team characteristics.

In this regard, the aforesaid studies didn't present the frame work in which how each activity are integrated and work as a unit to ensure sustainability of continuous improvement.

Few researchers namely Sulyman (2016)[10], Birhanu (2015)[11], Admasu (2013)[12] carried out their studies focusing on challenges and prospects of kaizen implementation, factors affecting sustainability of kaizen and transferability of the Japanese continuous improvement system respectively. Many of the studies on sustainability issues (table 1) emphasize the following characteristics or activities in order to sustain improvement outcomes over time: communication within the work area and across various levels of the organization, employee focus and commitment, improvement activity characteristics (e.g., project scope, goals, and improvement team dynamics), improvement culture, learning (education and training), management, measurement, and organizational structure and policies. But they didn't present a framework that depicts the interrelationship between each activity.

Author's Name	Type of model	Shortcomings
Imai (1986) [13]	Proposed kaizen implementation model which shows role of all layers of employees from top management to front line workers in kaizen initiatives.	It didn't show the procedure in which kaizen could be implemented and sustained it only puts work division.
Slobodan (2011) [14]	Presented 9 sets of principles as a kaizen implementation guideline	Asserts principles, but it didn't show how these principles are integrated to assure kaizen implementation then sustainability.
Upton (1996) [15]	Focuses on accelerating performance improvement, maintaining consistent long-term objectives, and choosing periodic projects based on organizational ability	It didn't show any frame work (guide line) how these principles could be implemented.
Tujuba (2016) [16]	Asserts a four-phase implementation strategy (current state mapping, revise policy, modify organizational culture and implementation of selected tools).	It didn't address the sustainability issue any longer.

Table 1: Kaizen Sustainability Models

The review of literature reveals that there is acute shortage of research studies on development of kaizen sustainability model in Ethiopian in general and Ethiopian Medium Manufacturing units in particular. To fill this research gap, the presented study entitled 'Development of Kaizen Sustainability Model in Medium Manufacturing Enterprises' is undertaken.

3. Objectives of the Study

The main objective of this research is to investigate factors impeding sustainability of kaizen in Ethiopian Medium Manufacturing Enterprises in the pursuit of development of kaizen sustainability model. The specific objectives of the study are listed below.

- To identify the root causes of wastes in MMEs.
- To examine the role of small group activities (SGA) in sustaining kaizen.
- To explore the social and technical system that affects the sustainability of Kaizen.
- To study success factors of industries from international arena to be used as a benchmark to develop kaizen sustainability model in Ethiopian MME's context.

4. Methodology

Research methodology is a blue print of the way in which the research is going to be conducted and enlightens the methods to be followed in research activities which includes research design, locale of research, sampling framework, collection of data, framework for analysis and limitations.

4.1. Research Design

The main objective of this study is to identify the main factors distressing sustainability of kaizen and to tackle these problems, propose a kaizen sustainability model. To achieve the intended objectives of the study, both qualitative and quantitative research approaches have been used because using one of the approaches independently in the study does not bring the intended results of the research. The study is confined to pre-determined objectives and also depends on pre-planned methodology, it is descriptive in nature. It is also an action research as it gives suggestions and recommendations to improve Kaizen sustainability.

4.2. Locale of Research

The present study is conducted in Gurage Zone of Ethiopia. As no exclusive study on Kaizen Sustainability is carried out in this area, this area is selected. More over the researchers are familiar with the culture, language, local dialect and infrastructure facilities available in this area, which is highly essential for the response on the questionnaire.

4.3. Sampling Procedure and Data Collection

The study makes use of primary data, collected from TVET trainers, TVET leaders, MME operators and experts. Census is used for TVET leaders, MME operators and experts as their size is relatively small and purposive sampling is used for TVET trainers. The study employed both qualitative and quantitative research approach to investigate the extent to which kaizen is applied in MME's & the associated factors affecting its' sustainability. Data collection has been carried out using questionnaire to collect quantitative data and, interview to collect qualitative data. Direct personal observations involved in visiting of kaizen events in MME'S by using observation checklist to get real-time data.

Combination of a close and open-ended questionnaire was administered to 108 trainers, 24 TVET leaders, 32 MME's experts, and 42 MME's operators. Open-ended questions in the questionnaire were included to give chance to respondents to forward their additional opinions. Of course, it has been used for inference, rather than analysis.

5. Data Analysis, Findings and Discussion

5.1. Causes of Wastes

The fishbone diagram was drawn to identify the sources of wastes under the eight generic headings. The generic headings were used to prompt ideas during the brainstorming session with MME's operators. Layers of branches show thorough thinking about the causes of the problem. For example, under the heading "waiting," branches such as, unevenness, lack of cross-functional skill, push environment and underutilization have been emerged which were considered to be the root causes for waiting in MME's. In a similar way the root causes for the eight generic wastes were identified and drawn on the fishbone diagram (figure 1) and the root cause analysis is also presented in table 2, showing that there were about 23 major root causes associated with non-value adding process (wastage mechanisms) in MME's.

Figure 1: Cause and Effect Analysis Diagram of Sources of Wastes in MME's.
Source: Contribution of the Researcher

Types of Wastes	No	Root Cause	Verification
1	Waiting	A Unevenness	Idle employee Idle machines Idle workstations (starved workstations)
		B Lack of cross-functional skill	
		C Push environment	
		D Underutilization	
2	Inventory	H Push environment	Mess up in warehouse & other storage areas High carrying cost
		I No partnership with suppliers	
		J Presence of money bottleneck workstations	
3	Overproduction	N Push production system	High WIP Idle workstations
		O Make to stock	
4	Rework	R Unevenness	Too much correction on defects
		P Lack of cross-functional skill	
		Q Push environment	
		U Underutilization	
5	Intellect	E Prioritizing individual efforts than team goals	Idle people in one workstation & overburden on the other workstation.
		F No cross-functional thinking	
		G Non-participatory approach	
6	Motion	K Poor layout	Traveling to share tools Searching for information
		L Lack of tools & pieces of equipment	
		M Inadequate design of the workstation	
7	Transportation	S Lack of pieces of material handling equipment	Inadequate material handling equipment Traveling shared pieces of equipment
		T Poor layout	
8	Over-processing	V Unable to understand customer requirement	Working beyond actual customer requirement Redundancy

Table 2: Causes of the Eight Types of waste in MME's

5.2. Correlation between Different Variables vs. Kaizen Sustainability

Correlation between different variables vs. kaizen sustainability indicators is given in figure 2. Figure 2 shows that there is a strong correlation between active participation of employees, rewarding recognition scheme, provision of training, and use of PDCA-cycle vs. kaizen sustainability. There is a moderate correlation between use of visual management tool, auditing and inspection, and top management conviction vs. kaizen sustainability. Further there is a low but a positive correlation between levels of education vs. kaizen sustainability.

Figure 2: Correlation between Different Variables Vs. Kaizen Sustainability Indicators

5.3. Role of Small Group Activities

Small group activities could be any kind of team activities in order to improve business process, give solutions to problems, or do proactively. The most known small groups are quality circles with characteristics as developed in Japan and then transferred elsewhere. Out of the four indicating questions raised, the mean value of the respondents' views regarding Quality Control Circle (QCC) activities were 2.84, 2.91, 2.74 & 2.85 for functional diversity, active participation in kaizen, participation in decision making and collective responsibility respectively. Furthermore, the majority of operators joined quality control circle activity voluntarily (55%). The rest 45% is based on other's obligation and decision. From this result, we can conclude that significant number of the front-line workers do not have the motive for participating in quality control circle activities. Moreover, even though SGA'S in MME's were practicing QCC as problem-solving tools, it is not based on the right principles. From the researcher's observation and the Focused Group Discussion (FGD) made with MME's operators, there was no brainstorming session on issues related to work area and also no standard checklists, techniques used.

It is clear that the major problems hindering the role of SGA's activities in sustaining kaizen are, limited participation of MME's operators in kaizen event, centralized decision making, and absence of functional diversity in kaizen event teams and lack of team spirit (collective responsibility). Moreover, (Asnake Gudisa, 2016)[17], found that inadequate training and education, lack of proper support of management, insufficient awareness and lack of documentation of the achievements in exercising Kaizen were the challenges affecting SGA's in kaizen implementation.

5.4. Technical Factors Affecting the Sustainability of Kaizen

Respondents were asked the extent to which MME's perceive kaizen as a continuous improvement tool for which 26% strongly disagreed, 27% disagreed, 24% undecided, 15% agreed & 9% strongly agreed. The mean value for respondents' view for this item is found to be 2.53 which indicate that respondents agreed that there is no clear understanding of kaizen as the continuous improvement tool. Although the concept of kaizen is quite simple to understand, it is difficult to master and will need time before it is fully understood by all employees. Thus, training about the philosophy, the tools and techniques of kaizen, prior to implementation is required. In this regard, training modules should also be prepared in the context of MME's operators.

Concerned to proper use of kaizen implementation tools and techniques, the mean value of respondents view for this item is found to be 2.68, which shows it is impossible to generalize that MME's operators are adequately using kaizen implementation tools & techniques. Moreover from the observation of the researcher and the FGD made with MME's operators, it is noticeable that only 5S and QCC are used as tool for implementation despite the fact that kaizen is an umbrella concept composed of tools such as 5S, Suggestion System, Quality Control Circles (QCC) or Quality Circle (QC),

Total Quality Control (TQC), Total Quality Management (TQM), Toyota Production System (TPS), Just-In-Time (JIT) System, Kanban System, and so on. It is advisable for MME's to adopt the advanced applications and tools of kaizen to be competent in the global market since it is tricky to change the outcome without changing the system.

Regarding auditing and inspection work, the mean value of respondents view for this item is also found to be 2.66 which indicated that timely auditing and inspection is not evident. From observation also it is found that no standard checklists for follow up and schedule for inspection work were prepared.

Moreover, regarding the proper use of visual management tools, the mean value is 2.49 which show MME's operators are not using visual management tools properly. From the observation and the FGD made with MME's operators, it is found that majority of the enterprises didn't use visual management tools, like direction indicators, color coding, information board, kaizen board and so on. Due to this the workplace looks completely cluttered rather than being pleasant and attractive.

In general, 6 indicating questions were asked to respondents how technical factors were associated with the sustainability of continuous improvement in MME's and the average mean score was found to be 2.69 which signify that technical factors impede the sustainability of kaizen in MME's. In other words, the inadequate use of kaizen implementation techniques affects its sustainability.

5.5. Role of Leaders in Kaizen Implementation in MME's

To measure the role of leaders in MME's in kaizen implementation respondents were asked whether there is a support that senior leadership provide including material, supplies, equipment & assistance for organization. The mean value for this item is 2.98 which indicate that the role of senior leadership is not audaciously practical in sustaining kaizen. According to (Imai, 1986)[13] senior leadership has two major functions in sustaining kaizen, the first being creating a conducive environment (technological, managerial and operative), the second establishing standard for improvement.

The reward system reflects the organizational philosophy, democratic and innovative or autocratic and bureaucratic. Concerning reward & recognition, the mean value is 2.63 which show there is no adequate system in MME's to value the best performance.

Kaizen encourages employees to generate a great number of suggestions and works hard to consider and implement these suggestions, often incorporating them into the overall Kaizen strategy. An important aspect of the suggestion system is that each suggestion, once implemented, leads to an upgraded standard. Management should also give due recognition to employee's efforts for improvement. The respondents were also asked about management meetings regarding kaizen, for which the mean value is 2.78 based on the 5-points Likert scale. Further, during FGD, the MME's operators strongly raised that their ideas and suggestions for improvement is not even implemented by the management. Here it's the researcher's strong remark that top management should motivate employees to forward their suggestion for improvement for the practical implementation.

In general, to assess how the role of leadership is associated with the sustainability of kaizen, 5 questions were used, for which mean is 2.78 based on the 5-points Likert scale from which it's impossible to generalize that top management is committed to the sustainability of kaizen in MME's.

6. Kaizen Sustainability Model

Kaizen sustainability framework for MME's is proposed based on the findings of the research, the practical experience of the researcher and the detailed review of related literature (benchmarking of others' work). The proposed framework is wide in its scope that it integrates the whole process of kaizen implementation. It incorporates eight interrelated phases, and it is the systematic strategy that shows the interrelationship between different facets of implementation of continuous improvement to ensure its sustainability. The steps are the courses of actions used to rectify the identified problems hindering sustainability.

This model differs from other proposed models in that it is a comprehensive approach which entails from the selection of MME's for implementation by creating awareness through different means like the brainstorming of the top management to scaling up scheme to foster kaizen dissemination by means of implementation by example.

The other feature of the model is that the assessment issue is addressed just after the completion of training on kaizen concept, implementation tools and techniques. It is done with intent to be in a position to pre-determine success in the implementation phase. Otherwise, it is impossible to judge whether candidates are well equipped or not in the kaizen implementation tools and techniques with the provision of a short-term training. In this regard, if candidates are not competent during the assessment, they will be retrained meanwhile the implementation commences with competent candidates.

In the implementation phase, a generic implementation procedure is proposed due to the fact that there are no significant gaps in it. Just after implementation, the evaluation phase is integrated into the model in the pursuit of identifying the challenges faced and results obtained during implementation. Here performance criteria are proposed. Based on the evaluation, if set objectives are met to the required level, the management of MME's is expected to establish the standardized operating condition to maintain the achievement till the next improvement is initiated. If there is still gap, then, the implementation continues based on SDCA cycle.

Once a standard operating condition has been established, the sustaining phase follows in which industries make a habit to practice kaizen on a daily and continual basis. This is followed by recognition and rewarding scheme where best performance is valued. Here, the management is expected to give due attention by allocating the required resources and creating conducive environment.

After rewarding and recognition it's time to disseminate the achievements to other MME's in a similar sector, provided that there is a need. In other words, the scaling up scheme can be launched to address a larger number of MME's.

The scaling up scheme is incorporated to cut the cost of implementation.

In general, the proposed model encompasses interrelated steps to ensure sustainability of kaizen and it is an adequate tool to address the problems that are identified in this study. The proposed model presented in figure 3 is intended to fill this gap. The eight steps of the proposed model are described below.

6.1. Select

The study result showed that there is a moderate positive correlation (average of correlation coefficients of 0.56) between top management conviction and kaizen sustainability indicators. On the other hand, the study also revealed that the support of top management in the case industries was not audacious and this is identified as one of the affecting factors. Hence, selection phase is incorporated in the framework to prioritize enterprises for implementation based on the conviction and commitment level of top management.

6.2. Train

The study results show that there is a moderate positive correlation (0.56) between the training and sustainability indicators. Therefore, as more training is provided the sustainability will increase and vice versa. Also, there is a slight positive correlation (0.27) between the level of education and kaizen sustainability indicators, meaning that as the level of education of the operators increases kaizen sustainability will be enhanced and vice versa.

On the other hand, the result of the data analysis revealed that skill and knowledge gap on part of operators in the case industries were some of the main problems hindering sustainability of kaizen. Hence to ensure success in sustaining continuous improvement industries should train their operators prior to implementation.

The approach to train on kaizen should base on an Action Learning Model. The training module should be developed based on streamlined approach (level by level training). The course-training syllabus of kaizen should be designed to achieve real-time improvements, cost reduction, quality improvements, productivity improvement, and waste reduction in Processes. Further, MME's operators should also upgrade their educational level to cope up with the advanced application of kaizen tools and techniques in the long run.

6.3. Asses

The study revealed that 93% of respondents were trained in kaizen implementation tools, on contrary skill gap on kaizen implementation tools identified as a factor affecting sustainability. This is due to commencing into implementation without measuring the extent to which operators understood the implementation tools after training. The assessment is incorporated as part of the framework to help to be in a position to determine the level of understanding of operators before implementation.

Figure 3: Proposed Kaizen Sustainability Model

Hence the candidates should carry occupational assessment after completion of the training in which he/she is expected to be examined for 30% theoretical (knowledge test) and 70% practical (skill test) exam regarding the application of kaizen philosophy, tools and techniques.

The occupational assessment is administered by the National Center of Competence (COC). Knowledge is used to describe what candidates need to know if they are to perform competently. The application of knowledge is fundamental to the concept of occupational competence and is one of the defining characteristics of occupational standards. Competence and skill are not the same things. People need skills to be competent, but competence is about applying skills, knowledge, and attitudes to achieve a work function.

Here if the candidate is competent, he/she shall be awarded a certificate on the occupational level by the COC; and completed and passed the training and evaluation of the kaizen implementation on the respective level. If candidates are not competent, they should be retrained and re - assessed till they are familiar with the kaizen implementation tools and techniques. On the other hand, the implementation would proceed with competent candidates.

6.4. Implement

To implement the kaizen approach, what the organization need is to organize a team that has been consistent with the target process in the system. The team should be of cross-functional one so that it can deal with different arrays of problems associated with workplace. Typically, the people in this group should be the one that is trained and assessed so that they can start facilitating the kaizen methodology into the target industry. Kaizen is actually an activity that should be performed daily and work team should be provided a purpose which should go beyond improvement. When implemented correctly, kaizen will enable the organization to humanize the workplace as well as eliminate all the processes that need a lot of work from employees which can be about mental and physical activities.

Kaizen will also teach people how they can perform tasks in a rapid way through experiments. During the implementation phase, the work team follows the generic approach of kaizen implementation techniques. As articulated by Anh, et al., (2011)[18] for successful kaizen transferability, kaizen practices should be adapted to the local culture in order to have the highest probability of success.

Given that a kaizen is a vital approach to problem-solving, its application requires restructuring the organizational culture and then use formal root cause analysis to identify and correct the problem at the source. Thus, kaizen practices could be implemented by the manufacturing industries through cross-functional team cooperation of 8 to 12 people with a skilled facilitator to identify, measure, and correct the problem associated with the process.

In order to implement kaizen, MME's should follow the generic methodology of kaizen. Today, it is used to improve various kinds of processes that are involved in manufacturing, management and other supporting processes in the business.

6.5. Evaluate

The evaluation scheme is inbuilt in the model in the quest of identifying the success factors and constraints faced during the implementation phase. As it is clearly shown in the study there are problems associated with the kaizen implementation such as the inadequate use of tools, skill and knowledge gap, lack of collective responsibility and absence of active participation of operators were identified as problems linked with implementation and affecting sustainability. Hence to be in a position to ensure kaizen sustainability it should be evaluated just after implementation.

Performance review significantly impacts on workers' attitude and commitment towards Kaizen events (Glover 2010)[19]. The self-assessment and kaizen certification naturally drive the organization goal to continually improve the quality and the cost-effectiveness of providing the product or service through the systematic guide using Key Performance Indicators (KPIs). In employing the kaizen techniques, each workgroup needs its own set of KPIs to enable it to monitor its own progress. Each workgroup must examine its own work processes to develop the KPIs which describe how the group influences productivity across the key areas. The following are the proposed KPIs for kaizen event outcome:

No	Indicators	Metrics
1	Productivity	Percentage of enhanced productivity
2	Inventory levels	Percentage of decrease in inventory level
3	Inventory cost	Percentage of decreased inventory cost
4	Lead time	Percentage of shortening lead time
5	Number of accidents	Percentage of reduced accident per period
6	Machine Breakdowns	Percentage of machine breakdown per period
7	Searching time	Percentage of shortening of search time
8	Reject rate	Percentage of reduced reject rate per period
9	Rework	Percentage of reduced rework per period
10	Customer complaints	A rate of reduced customer complaints per period
11	Suggestions	Number of suggestions per period

Table 3: Proposed Key Performance Indicators for Kaizen Implementation

Source: Researcher's Own Contribution

It is not possible to adopt all the KPIs as one needs to adapt them to one's own organizational culture. The workgroup needs to discuss and prioritize the usage of KPIs to foster a productive work culture. The performance metrics for the extent of evaluation of kaizen sustainability should be based on the set goals for improvement.

6.6. Sustain

This phase of the framework is to sustain the changes from the kaizen event which is the most difficult part of CI. The study revealed that there is a direct moderate correlation between use of visual management tools (0.45) and kaizen sustainability. Hence to ensure sustainability of Kaizen, industries should pursue using visual management tools such as kaizen board, information board, labeling, color coding, red tagging, signal system and others based on their level to ensure a visual and a tidy or cluttered free workplace.

From the correlation analysis, it is also revealed that there is a direct moderate correlation (0.46) between auditing and inspection and that of kaizen sustainability indicators, hence to help the sustainability of Kaizen implementation, MME's should pursue a regular auditing and inspection scheme supported by standard checklists.

Here, sustaining is to mean that to make it a habit what has already been achieved during the kaizen event. To this end, MME's deserve to establish standard operating conditions so that each operator can follow them on a regular basis. Most importantly to ensure sustainability all employees from top management to a cleaning crew should participate in problem solving by coming with suggestions for improvement on a daily basis.

According to (Van et al. 2010)[20] the sustain phase handles the results after the kaizen event. In order to sustain the results properly, the results have to be measured, evaluated and adjusted. When sharing the results with other parties, it is important to make sure to standardize the best practices and share the lessons learned within the organization. However, if there is a problem in sustaining the outcome at any level (enterprise level or division level), it needs to go back to implementation phase based on SDCA cycle. From the correlation analysis indicates that there is a moderate direct correlation (0.51) between use of PDCA cycle and kaizen sustainability. Hence MME's should pursue to use SDCA cycle to re-implement the kaizen event when there is a serious problem associated with sustainability.

6.7. Recognize

The study results revealed that there is a moderate positive correlation (0.62) between recognition and reward vs. kaizen sustainability indicators. Hence MME's should trail recognition and reward scheme to create a competitive edge for continuous improvement. The reward and recognition scheme should address best performing individuals, divisions or industries based on set objective & adequate metrics

According to Bessant (2001)[21], after the performance review, the application of reward and recognition system helps to reinforce employees' behavior of continuous improvement. It is suggested that human resource (HR) policies should be reconstructed if it doesn't match the need of Kaizen culture. For example, in order to retain employees' long-term commitment and motivation, organizations should build a system which promotes intrinsic motivation like self-challenges as well as extrinsic performance-based rewards such as profit-sharing plans across the company to recognize and reward collective excellence (Recht and Wilderom, 1998)[22]

Organizational psychology emphasizes on building an organizational structure and culture to offer employees a safe and satisfying work environment and to motivate employees (Aamodt 2013)[23]. Brunet and New (2003)[24] found that Kaizen generates intrinsic psychological benefits for employees from work recognition and satisfaction. It is much easier for employees to receive the psychology acceptance for small but incremental improvements (Maurer 2012)[25].

6.8. Scale

The scaling up scheme is integrated into the framework to assure the wider reach of medium manufacturing enterprises after the outcomes & the success factors have been identified. The other advantage of the scaling up phase is to cut the cost of implementation in other industries. Explicitly considering the appropriate scale and reach of a given idea is important in ensuring that the appropriate resource and risk is taken to pursue it, so it is not stretched beyond a natural boundary to become a failure. To be effective in process improvement, there needs to be model enterprises in CI since the tools & techniques are obtained from abroad it may be difficult to master them at large scale.

Being evidence-based is the most common requirement for an innovation to be spread and scaled-up. Innovations demonstrated to be effective by having a positive impact on a problem (Elliot et al 2004)[26]. The scaling process is best served by having as many of the issues and troubles identified in evaluations addressed and resolved before beginning the scaling (Littlejohn et al 2003)[27].

7. Conclusions

Based on the results of the data analysis, it has been found that MME's operators didn't have fully trained and engaged in full basic kaizen practices. The training given was only for short period and limited to topics such as kaizen overview, 5S, and definition of Muda. The study has also revealed the role of SGA's in the sustainability of kaizen in MME's in such a way that despite the fact that significant number of QCC was organized, it had not been based on the known guiding principles. The main challenges and limitations identified during the study were centralized decision making on part of the top management, lack of team spirit (absence of collective responsibility), the absence of functional diversity in kaizen event team were the main problems hindering the activities of SGA's.

Further the associated technical and social factors impeding the sustainability of kaizen were critically scrutinized and found that there was no reward and recognition scheme, no audacious top management support, short-termism, skill and knowledge gap, no auditing and inspection supported by standard checklist, inadequate use of kaizen implementation tools was apparent, and poor use of visual management tools (VMT).

To ensure sustainability of kaizen in MME's a model has been developed. The model has eight interrelated phases. In each phase, activities are procedurally included, which can be countermeasures for the challenges hindering the sustainability. The proposed model overcomes the shortcomings of the models found in the literature.

8. Limitations of the Study

The present research study has some limitations. The first limitation is spatially, the study is confined to MMEs in Gurage Zone administration. Purposive sampling, a kind of non-probability sampling is used for the study. Hence generalization should be done carefully. The cost and time constraints were other limitations. In spite of these, an earnest effort made to carry out this research study to bring out useful recommendations.

The proposed model is the result of empirical study in Ethiopian medium manufacturing industries in specified case industries. It is best applicable in Ethiopian manufacturing environment. For application elsewhere, it could be modified accordingly.

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